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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/897,426	07/03/2001	Masaaki Nanaumi	107348-00127	8333

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ARENT FOX KINTNER
PLOTKIN & KAHN, PLLC
Suite 400
1050 Connecticut Avenue, N.W.
Washington, DC 20036-5339

EXAMINER

CREPEAU, JONATHAN

ART UNIT

PAPER NUMBER

1746

DATE MAILED: 04/04/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/897,426

Applicant(s)

NANAUMI ET AL.

Examiner

Jonathan S. Crepeau

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. - See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 99/29763 (Soczka-Guth et al) in view of Cavalca et al (U.S. Pre-Grant Publication No. 2001/0033960).

U.S. Patent 6,355,149, also to Soczka-Guth et al., is taken as an English-language equivalent of WO 99/29763. Regarding claim 1, in column 2 line 49, the '149 patent teaches a membrane electrode assembly for a fuel cell. Regarding claim 3, the membrane comprises sulfonated aromatic polyether ether ketone ("sPEEK") (see col. 1, line 50). The sPEEK does not contain fluorine (see col. 1, lines 53-63) and is inherently soluble in a solvent. Regarding claim 1, the ion exchange capacity (Ic) of the membrane is 1.35-1.95 meq/g (see col. 12, lines 56-67). The modulus of elasticity (i.e., dynamic viscoelastic modulus) of the membrane in the dry state at 23°C is greater than or equal to 1300 N/mm² (1.3 x 10⁹ Pa) (see col. 2, lines 37-45). Thus, the dynamic viscoelastic modulus at 85°C would inherently be at least 5 x 10⁸ Pa, as recited in claim 1.

Soczka-Guth et al. do not expressly teach that each electrode contains a polymer ion-exchange component, as recited in claim 1, or that the component comprises a polymer with a different solubility than the polymer comprising the membrane (claim 4).

The Cavalca et al. publication is directed to membrane electrode assemblies. In paragraph 124, the reference teaches that the electrodes contain an ionically conductive polymer that "can be substantially the same or different" than the polymer of the membrane.

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Cavalca et al. to incorporate a polymer ion-exchange component into the electrodes of Soczka-Guth et al. In paragraph 124, Cavalca et al. teach that "[i]n addition to supported metal catalyst, the electrode should further comprise ionically conductive polymer to improve the contact of the electrode to the membrane and increase catalyst utilization." Thus, the artisan would be motivated to incorporate a polymer ion-exchange component (i.e., SPEEK) into the electrodes of Soczka-Guth et al.

Further, the artisan would be motivated to use a polymer component in the electrodes of Soczka-Guth et al. having a different solubility than that used in the membrane, as recited in claim 4. In paragraph 124, Cavalca et al. teach that the two polymers "preferably are substantially the same. Substantially the same means that the two ionically conductive materials, for example, (i) can be selected to have different equivalent weights although having the same general chemical identity, (ii) can be used with different contents of fillers or additives; or (iii) can have the same general polymer backbone but different ionic groups." Cavalca et al. further teach in paragraph 125 that the electrode preferably contains a hydrophobic compound to

improve water repellency. These teachings would motivate the artisan to modify the composition, in particular the equivalent weight, of the SPEEK contained in the electrodes of Soczka-Guth et al. In column 2, line 59, Soczka-Guth et al. state that equivalent weight is the reciprocal of ion exchange capacity, and that ion exchange capacity refers to the ratio of sulfonated units to the total number of repeating units. Therefore, the artisan would be motivated to adjust the equivalent weight of the polymer in the electrodes of Soczka-Guth et al., to make the polymer more hydrophobic, as suggested by Cavalca et al. The artisan would be able to accomplish this by decreasing the proportion of sulfonated monomer units in the polymer. Accordingly, the polymer contained in the electrodes, being more hydrophobic, would inherently have a higher solubility in a nonpolar solvent than the polymer of the membrane. Thus, the subject matter of claim 4 would be rendered obvious.

3. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Soczka-Guth et al. in view of Cavalca et al. as applied to claims 1, 3, and 4 above, and further in view of Grot (U.S. Patent 5,547,911).

Neither Soczka-Guth et al. nor Cavalca et al. expressly teach that the weight ratio of ion exchange polymer to catalyst in the electrodes is in the range of 0.05 to 0.80, as recited in claim 2.

The patent of Grot et al. is directed to methods imprinting catalytically active particles on a membrane. In column 5, line 66 et seq., the reference teaches a fuel cell comprising an

electrode containing an ion-exchange polymer, wherein the ratio of ion exchange polymer to carbon-supported catalyst is 1:3 (0.33).

Therefore, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made because the artisan would be motivated by the disclosure of Grot et al. to use a polymer-to-catalyst ratio of 0.33 in the electrodes of Soczka-Guth et al. In column 5, line 67, Grot et al. teach that this ratio is "preferred" for fuel cell electrodes. Accordingly, this would provide the artisan sufficient motivation to use a polymer-to-catalyst ratio of 0.33 in the electrodes of Soczka-Guth et al.

Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Crepeau whose telephone number is (703) 305-0051. The examiner can normally be reached Monday-Friday from 9:30 AM - 6:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski, can be reached at (703) 308-4333. The phone number for the organization where this application or proceeding is assigned is (703) 305-5900. Additionally, documents may be faxed to (703) 305-5408 or (703) 305-5433.

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Any inquiry of general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

JSC

April 2, 2003



RANDY GULAKOWSKI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700
